Chapter 3.4 NONPOINT SOURCE ASSESSMENT

This chapter of the Virginia Water Quality Assessment 305(b) Report provides a watershed assessment of nonpoint source (NPS) pollution potential. The NPS pollution watershed assessment was prepared by the Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation (DCR-DSWC). It provides a comparative evaluation of the state's waters, on a watershed basis, to assist in the targeting of limited resources and funds for NPS pollution protection activities where they are needed the most.

This NPS assessment summarizes information from the Virginia Department of Conservation and Recreation, Virginia Department of Environmental Quality (DEQ), Virginia Department of Forestry (DOF), U.S. Department of Agriculture - Natural Resources Conservation Service (USDA-NRCS), Cooperative Extension Service (CES), local Soil and Water Conservation Districts (SWCDs), local governments, and other existing sources of information concerning nonpoint source impacts to Virginia waters.

Also included is information regarding rare, threatened, and endangered species provided by the Department of Conservation and Recreation, Division of Natural Heritage (DCR-DNH). This information provides an additional component to prioritize watershed protection - the protection of natural communities.

Statewide Nonpoint Source Pollution Watershed Assessment Methodology

The year 2000 nonpoint source pollution assessment was developed from both inventory data and monitored conditions. The inventory data has not changed from the last assessment but its use in the assessment process has. The monitored conditions were not previously used in setting priorities. The following sections discuss and present these components of the assessment and the methodology that was utilized to develop nonpoint source priorities within Virginia.

Inventory Data

Inventory data collected on a hydrologic unit basis were used to rank the watersheds for their potential for NPS pollution based on characteristics such as land use, animal densities, and other related data which have been developed in a uniform manner for all watersheds. Data were collected to address the NPS potential from three major land use categories: agricultural, urban, and forestry.

Inventory data were initially collected at the county level from various sources, including the 1992 Census of Agriculture (U.S. Department of Commerce, 1989), 1990 National Survey of Conservation Tillage Practices (Conservation Technology Information Center, 1990), and the 1992 Natural Resources Inventory (Natural Resources Conservation Service). Livestock and poultry inventories, land use, and erosion rates for the above mentioned sources were updated as required.

The county level data was then disaggregated to individual watersheds using questionnaires developed for each county. The questionnaires contained the updated inventory data totals and the list of hydrologic units found in the county, including the portion of the county which each hydrologic unit comprised. Questionnaires were completed by DCR, NRCS, SWCD, USDA Farm Service Agency (FSA), CES, DOF and other field personnel, who used county level watershed maps to spatially assist with the disaggregation. Adjustments to county level data based on local knowledge were also performed. Table 3.4-1 shows the types of data which were collected and disaggregated to watershed units in the described manner. The disaggregated form of this data constitutes a major portion of the Hydrologic Unit Database of the DCR-DSWC.

The Department of Conservation and Recreation, in conjunction with local units of government, also provided information concerning disturbed land for regulated erosion and sediment (E&S) control projects. This data was used to estimate sediment loads from urban development activities.

In addition, the Virginia Department of Forestry (DOF) provided information on forestry harvesting and reforestation activities across the state. DOF estimates included data on acres of forest harvesting, site preparation and reforestation. These data were used in conjunction with erosion rate data to estimate erosion from forest harvesting and site preparation activities. The results of these estimations are discussed later in this chapter.

Table 3.4-1 Data Collected by Watershed Using Questionnaire

A. Land use (areal extent in each category)

1. Crop land
    - I. Crop
    - ii. Hay
    - iii. Orchard
    - iv. Idle
    - v. NRCS Set-Aside
    - vi. Conservation Reserve Program
2. Pasture
3. Forest
4. Urban or built-up
    - I. Residential
    - ii. Industrial/commercial
    - iii. Other urban
5. Water

B. Livestock and Poultry (inventory)

1. Beef cattle
2. Milk cattle
3. Hogs/pigs
4. Sheep/lambs
5. Chickens
6. Broilers
7. Turkeys
8. Other (horses, fallow deer, etc.)

C. Erosion Information (areal extent in each category)

1. Crop
    - I. <T *****
    - ii. T-2T
    - iii. >2T
2. Pasture
    - I. <T
    - ii. T-2T
    - iii. >2T

***** "T" refers to soil-loss tolerance or maximum allowable soil loss.

In order to maintain a consistency with other circulating NPS assessment reports and maps, the ranking of hydrologic units for the inventory data components of the year 2000 assessment has maintained the same division of derived values into categories as used before; the top 20% of the values for each component being classified as Ahigh@, the next 30% being classified as Amedium@, and the remaining 50% classified as Alow@. *This applies to the individual component rankings of the inventory data only.* It does not apply to deriving the overall NPS ranking by hydrologic units, as will be noted in that section below, or to the new monitored condition components.

A discussion of each aspect of the inventory data collected and the analysis performed is discussed individually within the following sections.

Agricultural NPS Pollution Potential

Agriculture is a large and diverse industry in Virginia and accounts for approximately thirty percent of Virginia's land use. While this percentage is significantly lower than the national average, agricultural activities constitute a significant source of nonpoint source pollution in the state.

Nonpoint source contamination from agriculture originates from several different sources with different associated impacts. The following sections provide a comparative statewide assessment and prioritization of three agriculturally related types of NPS contamination. These types of NPS contamination are: 1) nutrient loads associated with agricultural crop, pasture and hay lands; 2) nutrients from agriculturally related animals; and, 3) erosion from agricultural crop land

and pasture land. The statewide NPS assessment and prioritization analyzes pollution potential from these types of agricultural activities. The assessment also takes into consideration NPS controls implemented through the Virginia Agricultural Best Management Practices Cost-Share Program and nutrient reductions that resulted from the Virginia Nutrient Management Program. These programs are administered by DCR.

Virginia's 2000 Agricultural Land Nutrient Load (AGLL) Priorities

AGLL priorities were developed using nutrient load estimates derived from the use of nutrient loading factors. Table 3.4-2 shows the nutrient loading factors applied to the land use acreage within each watershed. For each agricultural land use in the watershed, the acreage was multiplied by the corresponding loading factor to estimate yearly loads of nitrogen and phosphorus.

The nitrogen and phosphorus loads from the loading factors were summed to determine a yearly agricultural land nutrient load for each watershed. A per acre nutrient load was then calculated by dividing this nutrient load by the land area in each watershed. Finally, the AGLL was computed for each watershed by normalizing the computed unit loads utilizing the average nutrient load value of all the watersheds and the standard deviation of the nutrient load values. This procedure was performed so that this indicator could be compared to normalized rankings for other pollution indicators. Figure 3.4-1 displays the watersheds prioritized for agricultural land nutrient loadings.

Virginia's 2000 Animal Nutrient Load Priorities (AL)

AL priorities were developed using estimated nutrient loads produced by livestock and poultry. Nutrients produced each year by livestock and poultry were estimated by multiplying numbers of each animal type by an appropriate waste generation factor. The waste generation factors are based on average annual manure production and manure nutrient content for each animal type. Table 3.4-3 shows the nutrient loading factors applied to the animal waste within each watershed.

Table 3.4-2 Land Use Loading Factors

	Phosphorus kg/ha/yr (lb/ac/yr)	**Nitrogen** kg/ha/yr (lb/ac/yr)
1. Crop land		
crop	2.20 (1.96)	9.0 (8.0)
hay	0.85 (0.76)	5.0 (4.5)
orchard	0.75 (0.67)	2.5 (2.2)
idle land	0.75 (0.67)	2.5 (2.2)
FSA set-aside	0.75 (0.67)	2.5 (2.2)
CRP	0.75 (0.67)	2.5 (2.2)
2. Pasture	0.85 (0.76)	5.0 (4.5)
3. Forest	0.20 (0.18)	2.5 (2.2)
4. Urban or built-up		
residential	1.10 (0.98)	5.0 (4.5)
industrial/commercial	2.60 (2.32)	11.0 (9.0)
other urban	0.60 (0.54)	4.0 (3.6)
5. Water	0.00 (0.00)	0.0 (0.0)

Source: Beaulac and Reckhow (1982)

Table 3.4-3 Animal Waste Loading Factors

	Phosphorus kg/yr/animal (lb/yr/animal)	**Nitrogen** kg/yr/animal (lb/yr/animal)

1. Beef cattle		15.11 (33.32)	84.81 (187.1)
2. Milk cattle		18.20 (40.15)	56.26 (124.1)
3. Hogs/pigs	(**2**)	0.81 (1.79)	2.40 (5.3)
	(**2**)	2.48 (5.48)	7.43 (16.4)
4. Sheep/lambs		1.09 (2.41)	7.43 (16.4)
5. Chickens		0.18 (0.40)	0.5 (1.1)
6. Broilers		0.09 (0.20)	0.41 (0.9)
7. Turkeys		0.44 (0.98)	1.99 (4.4)
8. Other			
horses		7.61 (16.79)	44.70 (98.6)
fallow deer		1.09 (2.41)	7.43 (16.4)

Source: Midwest Plan Service (1983) and American Society of Agricultural Engineers (1983)

Nitrogen and phosphorus estimates within each watershed were summed for all animal types to determine an estimated yearly animal load. A unit load was then calculated by dividing this nutrient load per hydrologic unit by the land area in each watershed. Finally, AL was computed for each watershed by normalizing the computed unit loads utilizing the average animal nutrient load value for all watersheds and the standard deviation of the animal nutrient load values. Figure 3.4-3 displays the animal nutrient load priorities by watershed statewide.

Virginia's 2000 Agricultural Erosion Priorities (AGER)

AGER priorities were evaluated using estimated erosion from agricultural land only. Potential annual erosion rates were estimated using erosion information from the questionnaires previously discussed and the Virginia 1982 National Resource Inventory (NRI) (NRCS, 1992). The questionnaires provided erosion information as amounts of crop land and pasture eroding at pre-defined ranges. These ranges were based on the soil-loss tolerance or maximum allowable soil loss ("T" values). The acreage within each watershed was distributed amongst three erosion rate categories: less than "T", between "T" and "2T", and greater than "2T". Appropriate erosion rates were developed from the 1987 NRI based on the erosion ranges and acreage.

Estimated soil loss from the agricultural land categories was summed to estimate an agricultural erosion load for each hydrologic unit. A unit load was then calculated by dividing this erosion load by the land area in each watershed. Finally, the agricultural erosion load was normalized utilizing the average erosion rate for of all watersheds and the standard deviation of the erosion rates.

Figure 3.4-3 displays the watersheds with the priority areas for agricultural erosion potential.

Virginia's 2000 Total Agricultural NPS Pollution Priorities (AGTOT)

AGTOT priorities were computed for each watershed based on the three components discussed above. Agricultural land load (AGLL) assesses potential nutrients in runoff from crop, pasture, and hay land. Animal nutrient load priorities (AL) account for nutrient contributions from livestock and poultry. Agricultural erosion priorities (AGER) ranks watersheds based on potential erosion occurring on agricultural land. The AGTOT for each watershed was computed as follows:

$$AGTOT_i = AGLL_i + AL_i + AGER_i$$

where *i* represents the watershed of interest.

Figure 3.4-4 presents the total agricultural NPS pollution priorities statewide, which represents each watershed's relative significance in contributing to agricultural NPS pollution throughout the state. Watersheds with the higher priorities are the greatest priority for targeting agricultural conservation programs.

Urban NPS Pollution Potential

Urbanization of forest and agricultural land is occurring at a rapid rate in many parts of Virginia. This urbanized growth results in increased NPS pollution as the result of precipitation washing nutrients, sediment, and other toxic substances from the impervious surfaces that make up these areas. The sources of these surface contaminants include: air and rain deposition of atmospheric pollution; littered and dirty streets; traffic by-products such as petroleum residues, exhaust products, heavy metals and tar residuals from the roads; chemicals applied for fertilization, control of ice, rodents and other pests; and sediment from construction sites.

Illegal industrial, commercial and domestic hook-ups to storm sewers also contribute a number of specific pollutants to water courses, as do inadequate sewage disposal systems both for municipalities and individual homes.

The following sections provide a comparative statewide assessment and prioritization of two urban related types of NPS pollution. These include nutrient loads from urban areas and erosion from urban lands and construction sites. The statewide assessment does not directly account for many of the other contaminants coming from urban lands; however, the weight of the urban priorities in the overall NPS pollution priorities has been established at a level which hopefully compensates for these problems.

Virginia=s 2000 Urban Nutrient Load Priorities (UNUT)

UNUT priorities were developed using nutrients estimated from loading factors for urban land uses. Table 3.4-2 shows the loading factors applied to the different urban land uses within all watersheds. As previously stated, the acreage of each urban land use in a watershed was multiplied by the corresponding loading factor. Those results were then summed within a watershed to estimate yearly loads of nitrogen and phosphorus available for NPS pollution per hydrologic unit. Unit loads were then calculated by dividing this nutrient load per hydrologic unit by the land area in each hydrologic unit. Finally, UNUT was computed for each watershed by normalizing the computed unit load per hydrologic unit by the average nutrient load value of all watersheds and the standard deviation of the nutrient load values. This procedure was performed so that the two urban indices would be comparable in value.

Figure 3.4-5 displays the urban land nutrient loading priorities statewide by hydrologic unit. The priorities generally identify the major urban areas within Virginia and reflect the general urbanized area of Tidewater Virginia as compared to the remainder of the state.

Virginia=s 2000 Urban Erosion Priorities (UERO)

UERO priorities were developed by estimating erosion rates from disturbed and undisturbed urban lands. Disturbed urban areas were estimated by DCR erosion and sediment control field personnel in consultation with local government staff for each watershed by estimating the amount of urban land that disturbed. This estimate is based primarily on land that under development and regulated by the Virginia Erosion and Sediment Control Law (Title 10.1, Chapter 5, Article 4, Section 10.1-560 of the Code of Virginia). All other urban lands identified within the watershed were considered undisturbed. An erosion rate of 45 tons/acre was assigned to disturbed land and .6 tons/acre to undisturbed land. An Urban erosion load was then calculated for each watershed by summing the calculated urban soil loss loads for disturbed and undisturbed land. Dividing this total load by the land area within each watershed determined the unit load for each watershed. The unit loads were then normalized utilizing the average urban erosion rate of all watersheds and the standard deviation of the erosion rates.

Figure 3.4-6 displays the watershed priorities for urban erosion statewide. The priorities are reflective of the areas of Virginia which are undergoing the most significant urban development activity. It is important to keep in mind that these priorities are based on pollution potential and do not compensate for control measures that may be in place in some areas.

Virginia=s 2000 Total Urban Pollution NPS Priorities (UTOT)

UTOT priorities were computed for each watershed based on the two components discussed above. Urban nutrient land loads (UNUT) account for nutrient contributions from practices on specific urban land uses. Urban erosion priorities (UERO) ranks watersheds based on potential erosion occurring on urban land, disturbed and undisturbed. The UTOT for each watershed was computed as follows:

$$UTOT_i = UNUT_i + UERO_i$$

where *i* represents the watershed of interest.

UTOT priorities are indicated on Figure 3.4-7. These priorities reflect the relative potential significance of each watershed in contributing to urban NPS pollution on a comparative statewide basis. Figure 3.4-7 indicates, as expected, that the highest priority urban areas are those portions of the state already containing substantial developed areas or that are currently urbanizing.

Forestry Nonpoint Source Pollution Priorities

The Virginia Department of Forestry (DOF) has been tracking numerous activities of the forest industry to facilitate

the proper management of Virginia's forest resources relative to water quality. Among these activities are the recording of forest harvesting, site preparation, and reforestation acres on a watershed and county basis. This information, in conjunction with other scientific data, provides a management tool for targeting and evaluating the NPS pollution potential of forestry activities on a statewide basis and serves as the principal component of the forestry NPS assessment database.

The following maps and analysis attempt to quantify soil erosion from timber harvesting and site preparation activities. These activities may contribute to increased sedimentation of the state's waters and potential physical and biological impacts if proper management does not occur. Data relating to forestry activities was developed by DOF foresters. The maps depict and are reflective of the relative level of forest activity occurring on a per acre basis within each watershed for the calendar year 1994 only. The analysis and maps make no attempt to account for proper management, or lack thereof, and reflect only the potential for forestry related NPS concerns.

Virginia=s 2000 Forestry Harvested Erosion Priorities (FHAR)

FHAR priorities were calculated for each watershed by multiplying the total acres harvested during 1994 by the logging erosion rates for the appropriate Major Land Resource Area (MLRA). Erosion rates by MLRA are listed in Table 3.4-4. The “per unit” value was then calculated by dividing the above result by the total acreage of the watershed. Figure 3.4-8 displays the statewide watershed priorities for forest harvesting activities.

Virginia=s 2000 Forestry Site-Prepared Erosion Priorities (FSIT)

FSIT priorities were calculated for each watershed by first multiplying the sum of site-prepared acres during 1994 in a hydrologic unit by the percentage of those acres which were being site prepared by each practice type (burning, mechanical, and chemical). The percentage occurrence of each site preparation practice in a state resource area was determined by the DOF. Using a relationship between state resource areas and MLRAs, the resulting acres for practice type within a watershed was multiplied by the practice type=s erosion rates as reported in Table 3.4-4 by MLRA. A per unit value was then calculated by dividing the sum of these results per watershed by the total land acreage of the watershed. The priority watersheds for site preparation activities are shown in Figure 3.4-9.

Virginia=s 2000 Total Forestry Erosion Priorities (FTOT)

FTOT priorities were computed for each watershed based on the two components discussed above. Forestry harvested erosion priorities (FHAR) account for nutrient contributions from logging practices. Forestry site prepared erosion priorities (FSIT) ranks watersheds based on ptential erosion from site preparation activities. The FTOT for each watershed was computed as
follows:

$$FTOT_i = FHAR_i + FSIT_i$$

where *i* represents the watershed of interest.

The total forestry rankings are depicted in Figure 3.4-10.

The forestry rankings are affected principally by the number of acres subject to a specific forest activity and the erosion rates assigned to the region. In general, more forest harvesting and site preparation occurs in Virginia's piedmont and coastal areas. However, erosion rates for these areas are much lower than the rates recorded for western portions of the state. The higher western rates tend to cause the rating of forestry areas in the west to be higher than areas in the east with similar activity levels. This pattern is consistent with other non-forestry activities, such as agriculture, and is due largely to topography and the variation of soil types.

It should be noted that only a fraction of all sedimentation in Virginia is caused by timber related activities, and its duration is usually only two or three years following harvest. Most logging related erosion is restricted to roads and trails used to remove logs from the forest or to land that is being prepared for reforestation.

Table 3.4-4 Erosion Rates on Forest Lands

Forest Activity					
MLRA	Logging Only	Burn	Chop/Burn	Bull-Dozing	Chemical
Erosion Rates (lbs./ac./yr.)					

125	0.43	3.6	0.14*	13.7*	0
128	1.75	3.6*	0.14*	13.7	0
130	3.68	3.6*	0.14*	13.7*	0
136	0.48	0.16	0.38	1.9	0
147	1.75!	3.6*	0.14*	13.7*	0
148	0.13	3.6*	0.14	13.7*	0
133A	0.45	0.15	0.36	0.78	0
153A	0.08	0.10	0.15	0.78	0
153B	0.08	0.10	0.15	0.78	0

! No data was reported for MLRA 147; assumed similar to MLRA 128.
*No data was reported. Values assumed based on guidance from Virginia Department of Forestry.

Source: Dissmeyer and Stump, 1978

Monitored Conditions

Several monitored conditions were used to rank the watersheds for their existing NPS pollution characteristics. These conditions were of two types: measures of nutrients at ambient monitoring stations in Virginia, and reported NPS related Awater quality limited@ water bodies or portions of water bodies. A discussion of each aspect of the monitored conditions data, the
analysis performed, and statewide assessment of the data is discussed individually within the following sections.

Ambient Water Quality Monitoring (AWQM)

Based on expectations arising from previous NPS program experience, measures for the nutrients total nitrogen and total phosphorous were obtained and evaluated for use as potential indicators of existing NPS conditions. These measures were obtained for three parameters for every AWQM station in Virginia for all readings occurring in the period 1 July 1992 to 31 June 1997. The three parameters, obtained from the STORET databases, were Total Phosphorous, Total Nitrate Nitrogen, and Total Kjeldahl Nitrogen. Following the retrieval, Total Nitrogen was derived per station reading by adding the Total Nitrate Nitrogen of that reading to the Total Kjeldahl Nitrogen measure of that reading.

Every measure of Total Phosphorous and Total Nitrogen was then assigned a Aparameter status classification@ relating the observed parameter concentrations to a general description of conditions - essentially a comparison of observed conditions to optimal conditions. From the optimal measures to those most harmful, the classifications were excellent, good, fair, poor, and severe.

In order to rank hydrologic units by the relative concentrations of nitrogen and phosphorous which were collected at specific point locations (monitoring station sites) around the state, it was necessary to associate each monitoring station with a watershed. The location of all AWQM stations were verified with the assistance of the DEQ and geocoded to the hydrologic unit they were within. To improve this association, however, each station was assigned the hydrologic unit whose waters it was considered to be primarily measuring. Thus a station at the far upstream portion of a downstream watershed could become associated with the upstream watershed it was deemed to be measuring rather than the downstream watershed where it was actually found.

To develop one rank per hydrologic unit, regardless of how many stations had been associated to that unit, it was necessary to evaluate each watershed by determining the percentage of readings per nutrient which were assigned the poor or severe class for that nutrient against all valid measures taken for that nutrient in that watershed.

Not all watersheds could be included in this ranking process. Of the 494 hydrologic units in Virginia, total nitrogen readings could not be associated with 109 of them. Likewise, 108 hydrologic units did not have an associated total phosphorous reading. The primary cause for the lack of readings in these watersheds is the lack of AWQM stations within or associated with them.

Once the poor and severe class percentages were determined, the top 6 percent of those units included in the ranking process per nutrient were assigned the highest NPS rank for that nutrient. The next 10 percent were assigned the medium rank, and the others were assigned the lowest rank. These percentages were used to reflect a “relative weighting” of the nutrient ranking process as it would pertain to the development of a single NPS ranking per hydrologic unit.

Statewide ranking maps of both total nitrogen and total phosphorous were created and evaluated by DCR and

DEQ personnel for their effectiveness as NPS indicators. This evaluation found the total phosphorous measures to be more closely associated with point source pollution activities than nonpoint, whereas the total nitrogen indications were found to be well correlated to known NPS conditions. Therefore, although they have been collected, classed, ranked, mapped, and made available, *the total phosphorous measures were not used in the composite NPS ranking of hydrologic units.* The priority watersheds for monitored total nitrogen are shown in Figure 3.4-11.

Impaired Waters

In accordance with US EPA guidance and protocol, the DEQ has assembled a list of the Awater quality limited@ waters of Virginia. Waters so listed do not meet one or more of the EPA=s five designated uses for water. Waters listed with NPS related sources were used in the NPS assessment process as an existing measure, as were those waters not explicitly listed as having an NPS source but which (a) did not list a point source either, and (b) listed possible agriculture related impairment causes and fell geographically within a medium or high Total Agriculture ranked watershed, or (c) listed possible urban related impairment causes and fell geographically within a medium or high Total Urban ranked watershed. The Total Agriculture and Total Urban rankings were derived from the inventory data as previously described.

Prior to its use in the NPS assessment, a copy of the DEQ database of waters listed as being impaired was modified. The original database defined many attributes of the impaired water segments, including the beginning and ending limits of the impaired waters, impaired area (if estuarine) or length (if riverine), impairment causes, and impairment sources. Additional records were created for impaired waters added to the state=s initial list by the EPA in May 1999. Some existing records, which described multiple segments or branches, were split. Records to be used in the NPS assessment as per the above source criteria were tagged with an NPS source indicator. An additional tag was used to define those estuarine impairments that were considered to occur on the main stem of a water body versus those that were not.

Using the modified impaired waters database and the boundaries of the hydrologic units, the impaired waters with NPS source tags were divided by the hydrologic unit boundaries into segments by watershed. This allowed for the summation of impaired water lengths or areas by watershed.

Riverine Impairments

Summed lengths of impaired riverine water features per hydrologic unit were compared, for ranking purposes, to the total length of riverine systems monitored per hydrologic unit. The amount of riverine waters considered water quality monitored by the state was determined by the DEQ using EPA assessment guidance. Calculating the percentage of *monitored* riverine waters that were impaired per hydrologic unit was preferable to a comparison of total impaired lengths against total existing lengths per watershed, but it still misrepresented the conditions in watersheds with only minor segments of associated water quality monitored riverine features. For instance, a hydrologic unit with only 0.1 miles of impaired riverine waters would rank high if only 0.1 miles of riverine waters were considered monitored in that watershed. Therefore, a function was developed and applied to somewhat moderate this skewing.

Of the 494 hydrologic units in Virginia, no amount of riverine water quality monitoring occurred in 43 of them. The riverine function was therefore not applied in these watersheds and they were not included in the riverine impairment ranking process. Again, the primary cause for the lack of monitored riverine waters in these watersheds was the lack of AWQM stations in them or associated with them, since by association they may have otherwise had monitored riverine segment lengths by being within a short distance upstream of station sites in downstream watersheds.

Following the calculation of the riverine function per hydrologic unit, the top 10 percent of those units included in the ranking process were assigned the highest NPS rank for riverine impairments. The next 20 percent were assigned the medium rank, and the others were assigned the lowest rank. These percentages were used to reflect a “relative weighting” of the riverine impairment ranking process as it would pertain to the development of a single NPS ranking per hydrologic unit.

Figure 3.4-12 displays the ranking of hydrologic units for impaired riverine waters.

Estuarine Impairments

Summed areas of impaired estuarine water features per hydrologic unit were compared, for ranking purposes, to the total area of estuarine systems monitored per hydrologic unit. The amount of estuarine waters considered water quality monitored by the state was determined by the DEQ using EPA assessment guidance.

As previously noted, estuarine waters were divided into the categories Amain stem@ and Anot main stem@. Most of

the impaired main stem estuarine water bodies in Virginia have listed impairment causes that are not considered to be due to (with any significance) practices occurring in the hydrologic units that the main stems flow through. Their impairment sources are considered to be more broadly dispersed in the basin, including the upstream portions of the basin which are beyond the estuarine system. To prevent the implication that the hydrologic units through which these main stem estuarine waters flow are responsible for the large amount of impaired estuarine waters in their domain, and erroneously ranking them accordingly, main stem estuarine waters were not included in the summing of impaired estuarine waters per hydrologic unit.

Most of the 494 hydrologic units in Virginia do not contain estuarine waters. With the further disqualification of those that contain only main stem estuarine waters, and those with estuarine waters but without monitored estuarine waters, only 63 watersheds were included in the ranking of impaired estuarine waters. For these watersheds, the percentage of the monitored area of qualified estuarine waters that were deemed impaired was calculated.

Of the hydrologic units included in the impaired estuarine waters ranking process, the top 5 percent were assigned the highest NPS rank for estuarine impairments. The next 10 percent were assigned the medium rank, and the others were assigned the lowest rank. These percentages were used to reflect a relative weighting of the estuarine impairment ranking process as it would pertain to the development of a single NPS ranking per hydrologic unit.

Figure 3.4-13 displays the ranking of hydrologic units for impaired estuarine waters.

Virginia=s 2000 Overall Nonpoint Source Pollution Priorities

The year 2000 overall nonpoint source pollution priorities by hydrologic unit have been derived differently than they were for the 1998 305(b) report. Unlike the previous overall NPS assessment, which was based on a weighted combination of the total priority results from the agriculture (47.5%), urban (47.5%) and forestry (5%) inventory data sources, the 2000 overall assessment includes several monitored conditions and establishes an overall rank per hydrologic unit that is equal to the worse ranking obtained for a total category (Total Agriculture, Total Urban, Total Forestry, Total Nitrogen, Riverine Impairments, Estuarine Impairments). This ranking process is consistent with the assessment process performed in the 1998 Unified Watershed Assessment and Restoration Priorities report.

Each of the total ranking categories were weighted in a manner that befits the above process. For instance, relatively few hydrologic units were ranked high for Total Forestry or Impaired Estuarine, versus the number of high ranked watersheds for Total Agriculture or Total Urban. The same is true for the medium rankings. This weighting process maintained the relative importance amongst the indicators as found in the previous assessment for those indicators used in the last assessment, and incorporated the new assessment variables at a level determined by a committee of nonpoint source professionals.

Relative to one another the total rankings for inventory data categories remain consistent in deriving the overall NPS rank. By necessity, however, they were reclassified for use in deriving the 2000 overall NPS assessment since the individual ranks by category have a stronger influence over the overall rank in the new classification format. Therefore, the number of hydrologic units which were classified as being high for Total Agriculture, Total Urban, and Total Forestry, *for the purposes of determining overall rank only*, were reduced.

Table 3.4-7 lists the rankings per hydrologic unit for the overall NPS rank and for each of the total ranking categories used to derive it. Like the category rankings, the overall NPS rank by watershed is classified into three categories: high, medium, and low. Based on the described overall NPS ranking process, about 31% of the watersheds have been classified as high, 35.4% considered medium priority and the remaining 33.6% considered low priority.

Figure 3.4-14 displays the ranking of hydrologic units for overall NPS pollution.

In general, the overall NPS priorities continue to reflect Virginia=s urban and agricultural dominated regions. The Northern Virginia, Hampton Roads, Richmond, Roanoke, and Lynchburg areas have a considerable extent of high to medium rankings. Similarly, the agricultural influences due to crop land nutrient use on the Eastern Shore, intensive animal and other associated agricultural activities in the Shenandoah Valley area, and high erosion rates in Southwestern portions of the state are also key factors in the overall prioritization. Monitored conditions have added to or supported the rankings in these areas, but have also scattered high and medium rankings across the state. In a few areas, however, the addition of the monitored conditions have produced a more stark variance from the previous NPS assessment. The Appomattox River basin, southern Fauquier County, and northeastern Franklin County have all had a significant overall NPS ranking change, going from previous low to medium rankings to being ranked medium to predominantly high. Further investigation into the causes of these more drastic reclassifications will help refine the collection and/or use of the inventory data and perhaps account for the existence of noteworthy monitored NPS conditions where they were not

projected to occur.

Many other data sources could be used to further determine the potential NPS water quality impacts in a watershed and the need for protection. Both abandoned mine lands and septic system data have been noted in the past as having this potential. Work has begun to incorporate both into future NPS assessments.

For the first time, the 2000 NPS assessment included a mine land component in the form of the resource extraction impairments to water quality, as found in the impairment database and noted in the Impaired Waters section. All abandoned mined lands could be used in the assessment as indicators of potential NPS water quality degradation, however, as opposed to only using the monitored conditions. Knowledge of the locations of the mine lands would also help determine the source hydrologic units.

Septic system data collection is being investigated. Virginia is currently reviewing the work done in other states to identify failing septic systems. Most of this work involves modeling, as direct measure of septic system characteristics statewide is not currently available and is beyond the scope of any assessment. Modeling septic failures makes use of data from the Census of Population and Housing, which will be conducted anew in 2000. It is unlikely that failing septic systems will become an NPS assessment component until after this data becomes available in 2002.

Natural Heritage Resources Priority Ranking Methodology

Table 3.4-7 also includes a priority ranking of watersheds based on known occurrences of natural heritage resources. This data has been included to assist in the cross referencing of rare, threatened, and endangered species with overall NPS pollution priorities by hydrologic unit and thus help determine the relative importance of a given watershed regarding the protection of natural conditions or the need for restoration.

Natural heritage resources include the habitat of rare, threatened, and endangered plant and animal species and exemplary natural communities. DCR=s Division of Natural Heritage (DCR-DNH), responsible for identifying and inventorying Virginia=s natural heritage resources, has documented over 9350 occurrences of approximately 1460 rare plants and animals and 175 natural community types. Information about the status and location of these occurrences is used to prioritize and direct conservation activities, and to guide economic development activities that might impact these resources.

For purposes of this report, hydrologic units have been ranked for natural heritage resources according to the presence of aquatic resources only. This is the portion of the Commonwealth=s biodiversity that is directly dependent on the water quality of rivers, streams, wetlands, and groundwater. These priorities should direct the nonpoint source contamination mitigation efforts and other water quality improvement projects toward those watersheds in which natural heritage resources will benefit from the maintenance or enhancement of water quality.

The following procedure was followed to rank the hydrologic units for their significance to natural heritage resources.

- Only natural heritage resources likely to be directly impacted by changes in water quality were included in the assessment. These include aquatic plants and animals, and subterranean aquatic invertebrates. About 915 species and 34 natural communities are included.

- Natural heritage resource occurrences, that have been verified since 1970 and whose locations are known to an accuracy of within 1.5 miles on a 7.5 minute USGS quadrangle, are included. The total number of natural heritage resource occurrences considered is 3294, including 245 natural community occurrences. These occurrences are located in 297 of Virginia=s 494 hydrologic units.

- A formula was used to assign a score to each hydrologic unit. The factors used to determine this score were the number of natural heritage resource occurrences in the hydrologic unit and the global rarity (Grank) of these natural heritage resources, as established by the Network of National Heritage Programs and Conservation Data Centers. Weighted values were assigned to the global rarity rank of each natural heritage resource according to table 3.4-5.

Table 3.4-5 Global Rarity Ranking

Global Rarity Rank	WEIGHT
G1 (extremely rare and critically imperilled)	10

G2 (very rare and imperilled)	7
G3 (either very rare throughout its range or found in a restricted range)	4
G4 (common and apparently secure globally, though rare in Virginia)	2
G5 (very common and secure globally, though rare in Virginia)	1

These values were summed for each natural heritage resource occurrence in a hydrologic unit to calculate a final score for the watershed. Scores ranged from 0 (197 hydrologic units with no documented occurrences) to 1177 (one hydrologic unit with many occurrences).

! The scores were used to aggregate the hydrologic units into three priority classes: high, medium and low priority. Table 3.4-6 relates the raw scores to the priority classes and shows the distribution of the priorities. Natural heritage resource priorities are also represented on a map of Virginia, Figure 3.4-15.

Table 3.4-6 Hydrologic Unit Scoring

PRIORITY	WATERSHED SCORES	NO. OF HYDROLOGIC UNITS
High	18+	99 (20%)
Medium	4-17	146 (30%)
Low	0-3	249 (50%)

The lack of documented natural heritage resource occurrences does not guarantee that natural heritage resources are not present, because many watersheds have not been adequately inventoried. Consequently a low priority ranking could mean that there are no natural heritage resources present in a given watershed or it could mean that no resources have been recorded because the watershed has not been adequately surveyed. Information in DCR-DNH=s databases is continually added and updated. Project planners are encouraged to contact DCR-DNH for current and detailed information on the status of natural heritage resource occurrences.

Table 3.4-7 Statewide Nonpoint Source Pollution Rankings and Natural Heritage Priority Ranking By Hydrologic Unit

Watershed ID	Watershed Name	AGTOT	UTOT	FTOT	TOTN	RIMP	EIMP	**OVERALL**	NHR
A01	POTOMAC RIVER / PINEY RUN / DUTCHMAN CREEK	M	L	L	L	M	N	M	M
A02	CATOCTIN CREEK	H	L	L	M	H	N	H	M
A03	POTOMAC RIVER / LIMESTONE BRANCH	H	L	L	M	L	N	H	L
A04	UPPER GOOSE CREEK / GAP RUN	L	L	H	L	L	N	H	M
A05	MIDDLE GOOSE CREEK / PANTHER SKIN CREEK	M	L	L	L	M	N	M	M
A06	NORTH FORK GOOSE CREEK	H	L	L	M	M	N	H	M
A07	BEAVERDAM CREEK	M	L	M	L	H	N	H	L
A08	LOWER GOOSE CREEK / LITTLE RIVER	M	M	M	L	M	N	M	M
A09	POTOMAC RIVER / BROAD RUN	M	H	L	M	L	N	H	L
A10	SUGARLAND RUN	L	H	L	L	L	N	H	L
A11	POTOMAC RIVER / DIFFICULT RUN	L	H	L	L	M	N	H	H
A12	POTOMAC RIVER / FOURMILE RUN / PIMMIT RUN	L	H	L	M	M	L	H	L
A13	CAMERON RUN	L	H	L	M	L	L	H	M
A14	POTOMAC RIVER / DOGUE CREEK / LITTLE HUNTING CREEK	L	H	L	H	N	L	H	M
A15	ACCOTINK CREEK	L	H	L	M	H	N	H	M
A16	POHICK CREEK	L	H	L	M	L	N	H	M
A17	UPPER CEDAR RUN / LICKING RUN	M	M	L	L	H	N	H	L
A18	LOWER CEDAR RUN / TOWN RUN	M	L	L	L	H	N	H	M
A19	BROAD RUN / KETTLE RUN	L	M	M	L	L	N	M	M
A20	UPPER OCCOQUAN RIVER / LAKE JACKSON	L	H	L	L	L	N	H	L
A21	UPPER BULL RUN / LITTLE BULL RUN	L	M	L	L	M	N	M	H
A22	CUB RUN	L	H	L	L	L	N	H	M
A23	LOWER BULL RUN / POPES HEAD CREEK	L	H	L	L	M	N	H	L
A24	OCCOQUAN RIVER - RESERVOIR	L	H	L	N	N	N	H	L
A25	POTOMAC RIVER / LOWER OCCOQUAN RIVER / NEABSCO CREEK	L	H	L	L	L	L	H	H
A26	POTOMAC RIVER / QUANTICO CREEK / CHOPAWAMSIC CREEK	L	H	L	L	L	L	H	H
A27	UPPER AQUIA CREEK / BEAVERDAM RUN	L	H	L	L	L	N	H	M
A28	LOWER AQUIA CREEK	L	H	L	L	N	L	H	M
A29	POTOMAC RIVER / POTOMAC CREEK	L	M	L	L	L	L	M	H
A30	POTOMAC RIVER / UPPER MACHODOC CREEK	L	M	L	M	L	L	M	H
A31	POTOMAC RIVER / MATTOX CREEK / POPES CREEK / ROSIER CREEK	L	M	L	M	L	M	M	H
A32	POTOMAC RIVER / NOMINI CREEK / LOWER MACHODOC CREEK	L	M	L	L	L	L	M	M
A33	POTOMAC RIVER / YEOCOMICO RIVER	M	L	L	L	L	L	M	M
A34	POTOMAC RIVER / COAN RIVER / LITTLE WICOMICO RIVER	M	M	L	L	L	L	M	M
B01	UPPER NORTH FORK SOUTH BRANCH POTOMAC RIVER / LAUREL FORK	L	L	H	L	N	N	H	H
B02	UPPER SOUTH BRANCH POTOMAC RIVER	L	L	H	L	L	N	H	L
B03	UPPER SOUTH FORK SOUTH BRANCH POTOMAC RIVER	L	L	L	L	L	N	L	L
B04	SLEEPY CREEK	L	L	L	L	N	N	L	L
B05	UPPER BACK CREEK / ISAACS CREEK	L	L	L	L	L	N	L	L
B06	HOGUE CREEK	L	L	L	L	L	N	L	L
B07	LOWER BACK CREEK / BRUSH CREEK / BABBS RUN	M	L	L	L	L	N	M	M
B08	UPPER OPEQUON CREEK	M	M	L	H	H	N	H	L

Watershed ID	Watershed Name	AGTOT	UTOT	FTOT	TOTN	RIMP	EIMP	**OVERALL**	NHR
B09	LOWER OPEQUON CREEK	M	M	L	H	M	N	H	M
B10	UPPER MIDDLE RIVER	H	L	L	L	H	N	H	L
B11	MIDDLE RIVER / JENNINGS BRANCH	M	L	L	L	M	N	M	L
B12	MIDDLE RIVER / LEWIS CREEK	M	H	L	M	M	N	H	L
B13	MOFFETT CREEK	H	L	L	L	M	N	H	L
B14	CHRISTIANS CREEK	H	L	L	H	H	N	H	M
B15	LOWER MIDDLE RIVER	H	L	L	H	H	N	H	L
B16	UPPER NORTH RIVER	L	L	L	L	L	N	L	M
B17	MIDDLE NORTH RIVER	H	L	L	M	M	N	H	L
B18	BRIERY BRANCH	H	L	L	M	L	N	H	L
B19	MOSSY CREEK	H	L	L	M	H	N	H	L
B20	UPPER DRY RIVER	L	L	L	L	L	N	L	M
B21	LOWER DRY RIVER	H	L	L	L	M	N	H	L
B22	MUDDY CREEK	H	L	L	L	H	N	H	L
B23	LOWER NORTH RIVER	H	L	L	H	H	N	L	L
B24	LONG GLADE CREEK	H	L	L	H	L	N	H	L
B25	COOKS CREEK	H	M	L	M	H	N	H	L
B26	BLACKS RUN	H	H	L	H	H	N	H	L
B27	PLEASANT RUN	H	L	L	H	M	N	H	L
B28	NAKED CREEK	H	L	L	H	H	N	H	L
B29	MILL CREEK	H	L	L	H	M	N	H	L
B30	UPPER SOUTH RIVER	H	L	L	L	H	N	H	H
B31	MIDDLE SOUTH RIVER / BACK CREEK	L	L	L	L	L	N	L	H
B32	LOWER SOUTH RIVER	L	M	L	L	M	N	M	H
B33	UPPER SOUTH FORK SHENANDOAH RIVER	L	L	L	H	M	N	H	H
B34	CUB RUN	H	L	L	H	H	N	H	L
B35	SOUTH FORK SHENANDOAH RIVER / ELK RUN / BOONE RUN	L	L	L	M	L	N	M	L
B36	NAKED CREEK	L	L	L	L	M	N	M	L
B37	SOUTH FORK SHENANDOAH RIVER / CUB RUN	L	L	L	M	L	N	M	L
B38	SOUTH FORK SHENANDOAH RIVER / MILL CREEK	M	L	L	H	H	N	H	M
B39	HAWKSBILL CREEK	M	L	L	M	M	N	M	M
B40	SOUTH FORK SHENANDOAH RIVER / GOONEY RUN	L	M	L	N	L	N	M	M
B41	LOWER SOUTH FORK SHENANDOAH RIVER	L	H	L	M	L	N	H	M
B42	UPPER NORTH FORK SHENANDOAH RIVER / GERMAN RIVER	L	L	L	N	N	N	L	L
B43	NORTH FORK SHENANDOAH RIVER / LITTLE DRY RIVER	L	L	L	N	N	N	L	L
B44	NORTH FORK SHENANDOAH RIVER / SHOEMAKER RIVER	L	L	L	N	L	N	L	M
B45	NORTH FORK SHENANDOAH RIVER / HOLMANS CREEK	H	L	L	H	M	N	H	L
B46	LINVILLE CREEK	H	L	L	H	H	N	H	M
B47	SMITH CREEK	M	L	L	H	H	N	H	H
B48	NORTH FORK SHENANDOAH RIVER / MILL CREEK	M	L	L	H	M	N	H	L
B49	STONY CREEK	M	L	L	L	L	N	M	M
B50	NORTH FORK SHENANDOAH RIVER / NARROW PASSAGE CREEK	M	L	L	H	M	N	H	H
B51	LOWER NORTH FORK SHENANDOAH RIVER / TUMBLING RUN	L	L	L	M	L	N	M	M
B52	UPPER CEDAR CREEK	L	L	L	L	L	N	L	M

Watershed ID	Watershed Name	AGTOT	UTOT	FTOT	TOTN	RIMP	EIMP	**OVERALL**	NHR
B53	LOWER CEDAR CREEK	M	L	L	L	L	N	M	M
B54	PASSAGE CREEK	L	L	L	L	L	N	L	M
B55	UPPER SHENANDOAH RIVER	L	H	L	M	L	N	H	L
B56	CROOKED RUN	L	M	L	L	L	N	M	M
B57	SHENANDOAH RIVER / SPOUT RUN	M	L	L	H	M	N	H	L
B58	LOWER SHENANDOAH RIVER	L	L	L	L	L	N	L	M
C01	CHESAPEAKE BAY / GREAT WICOMICO RIVER	M	M	L	L	L	L	M	M
C02	DRAGON SWAMP	L	L	L	L	L	L	L	M
C03	PIANKATANK RIVER	L	M	L	L	L	L	M	M
C04	CHESAPEAKE BAY / EAST RIVER / NORTH RIVER	L	M	L	L	L	L	M	M
C05	WARE RIVER	L	M	L	L	L	L	M	L
C06	CHESAPEAKE BAY / SEVERN RIVER	L	H	L	L	N	L	H	M
C07	CHESAPEAKE BAY / BACK RIVER / POQUOSON RIVER	L	H	L	L	N	M	H	H
C08	LYNNHAVEN RIVER / LITTLE CREEK	L	H	L	L	M	L	H	M
C09	POCOMOKE RIVER / PITTS CREEK	M	L	L	M	L	N	M	L
C10	CHESAPEAKE BAY / HOLDENS CREEK	L	L	L	M	L	L	M	M
C11	CHESAPEAKE BAY / ONANCOCK CREEK	M	L	L	M	N	L	M	L
C12	PUNGOTEAGUE CREEK	M	L	L	L	N	L	M	L
C13	NANDUA CREEK / OCCOHANNOCK CREEK / NASSAWADOX CREEK	M	L	L	L	N	L	M	M
C14	CHESAPEAKE BAY / HUNGARS CREEK	M	L	L	L	L	L	M	M
C15	CHERRYSTONE INLET / KINGS CREEK	H	L	L	L	N	L	H	M
C16	CHESAPEAKE BAY / OLD PLANTATION CREEK	H	M	L	N	N	L	H	M
D01	CHINCOTEAGUE BAY / LITTLE MOSQUITO CREEK	L	H	L	N	N	L	H	H
D02	ASSAWOMAN CREEK	M	M	L	M	L	L	M	L
D03	METOMKIN BAY / BURTONS BAY	M	L	L	H	M	N	H	H
D04	HOG ISLAND BAY / MACHIPONGO RIVER	M	M	L	L	N	L	M	H
D05	OUTLET BAY / RAMSHORN BAY	H	L	L	H	N	L	H	H
D06	MAGOTHY BAY / MOCKHORN BAY	M	M	L	H	N	L	H	H
D07	RUDEE INLET	L	H	L	N	N	L	H	L
E01	UPPER RAPPAHANNOCK RIVER / THUMB RUN / JORDAN RIVER	M	L	M	L	M	N	M	H
E02	RAPPAHANNOCK RIVER / CARTER RUN / GREAT RUN	M	L	H	M	M	N	H	H
E03	HUGHES RIVER	L	L	L	L	L	N	L	L
E04	UPPER HAZEL RIVER	L	L	L	L	L	N	L	M
E05	UPPER THORNTON RIVER	L	L	L	L	L	N	L	L
E06	LOWER THORNTON RIVER	M	L	L	L	L	N	M	M
E07	LOWER HAZEL RIVER / MUDDY RUN / INDIAN RUN	M	L	L	L	M	N	M	M
E08	RAPPAHANNOCK RIVER / MARSH RUN	M	L	L	L	M	N	M	M
E09	MOUNTAIN RUN	H	M	L	M	M	N	H	M
E10	RAPPAHANNOCK RIVER / DEEP RUN / ROCK RUN	L	L	L	L	H	N	H	L
E11	UPPER RAPIDAN RIVER / CONWAY RIVER	L	L	L	L	L	N	L	L
E12	RAPIDAN RIVER / SOUTH RIVER	L	L	L	L	L	N	L	L
E13	RAPIDAN RIVER / BLUE RUN / BEAUTIFUL RUN	H	L	L	L	L	N	H	H
E14	UPPER ROBINSON RIVER / WHITE OAK RUN	L	L	H	L	L	N	H	M
E15	LOWER ROBINSON RIVER / CROOKED RUN / DEEP RUN	M	L	L	MM	N	ML		

Watershed ID	Watershed Name	AGTOT	UTOT	FTOT	TOTN	RIMP	EIMP	**OVERALL**	NHR
E16	RAPIDAN RIVER / CEDAR RUN	H	L	L	ML	N	H	H	
E17	RAPIDAN RIVER / MINE RUN / MOUNTAIN RUN	M	L	L	L	L	N	M	L
E18	LOWER RAPIDAN RIVER	L	L	L	L	L	N	L	M
E19	RAPPAHANNOCK RIVER / MOTTS RUN	L	ML	L	L	N	M	L	
E20	RAPPAHANNOCK RIVER / MASSAPONAX CREEK	L	H	L	L	ML	H	L	
E21	RAPPAHANNOCK RIVER / MILL CREEK / GOLDENVALE CREEK	L	ML	L	N	L	M	H	
E22	RAPPAHANNOCK RIVER / OCCUPACIA CREEK / PEEDEE CREEK	M	L	L	L	L	L	M	H
E23	RAPPAHANNOCK RIVER / CATPOINT CREEK / PISCATAWAY CREEK	M	L	L	L	H	L	H	H
E24	RAPPAHANNOCK RIVER / TOTUSKEY CREEK	M	L	L	L	L	L	M	H
E25	RAPPAHANNOCK RIVER / LAGRANGE CREEK / LANCASTER CREEK	L	L	L	L	L	L	L	H
E26	LOWER RAPPAHANNOCK RIVER / CORROTOMAN RIVER	L	ML	N	L	H	H	M	
F01	UPPER SOUTH ANNA RIVER	L	L	ML	L	N	M	L	
F02	SOUTH ANNA RIVER / ROUNDABOUT CREEK	L	L	L	L	N	N	L	M
F03	SOUTH ANNA RIVER / TAYLORS CREEK	L	L	L	L	N	N	L	H
F04	LOWER SOUTH ANNA RIVER	L	ML	L	L	N	M	H	
F05	NEWFOUND RIVER	L	L	L	L	L	N	L	L
F06	UPPER NORTH ANNA RIVER	L	L	L	L	MN	M	L	
F07	LAKE ANNA / PAMUNKEY CREEK	L	L	L	L	MN	M	M	
F08	CONTRARY CREEK	L	MM	L	L	N	ML		
F09	LOWER NORTH ANNA RIVER / NORTHEAST CREEK	L	ML	L	L	N	M	L	
F10	UPPER LITTLE RIVER	L	L	L	N	N	N	L	L
F11	LOWER LITTLE RIVER	L	ML	L	L	N	M	L	
F12	UPPER PAMUNKEY RIVER / MECHUMPS CREEK	L	ML	L	M	L	MM		
F13	MIDDLE PAMUNKEY RIVER / BLACK CREEK / TOTOPOTOMOY CREEK	M	ML	L	M	L	MM		
F14	LOWER PAMUNKEY RIVER	L	L	L	L	L	L	L	H
F15	NI RIVER	L	ML	L	L	N	M	L	
F16	PO RIVER	L	L	L	L	L	N	L	H
F17	UPPER MATTAPONI RIVER / PONI RIVER	L	L	L	L	L	N	L	H
F18	MATTA RIVER	L	L	L	L	L	N	L	L
F19	SOUTH RIVER	L	ML	L	L	N	M	L	
F20	POLECAT CREEK	L	ML	L	L	N	M	L	
F21	MATTAPONI RIVER / HERRING CREEK / CHAPEL CREEK	L	L	L	L	L	N	L	M
F22	MARACOSSIC CREEK / BEVERLY RUN	L	L	L	L	L	N	L	M
F23	MATTAPONI RIVER / GARNETTS CREEK	L	L	L	L	L	L	L	H
F24	MATTAPONI RIVER / COURTHOUSE CREEK	L	L	L	L	L	L	L	H
F25	LOWER MATTAPONI RIVER	L	L	L	L	L	L	L	M
F26	UPPER YORK RIVER/POROPOTANK RIVER/QUEEN CREEK/ WARE CR	L	ML	L	L	L	M	H	
F27	LOWER YORK RIVER / CARTER CREEK / KING CREEK	L	H	L	L	N	L	H	M
G01	JAMES RIVER / FALLING CREEK / PROCTORS CREEK	L	H	L	L	ML	H	L	
G02	JAMES RIVER / TURKEY ISLAND CREEK / FOURMILE CREEK	L	ML	L	M	L	MM		
G03	JAMES RIVER / POWELL CREEK / WEST RUN / BAILEY CREEK	L	ML	L	L	L	M	H	
G04	JAMES RIVER / WARDS CREEK / UPPER CHIPPOKES CREEK	L	L	L	L	L	L	L	H
G05	UPPER CHICKAHOMINY RIVER / UPHAM BROOK / STONY RUN	L	H	L	L	MN	H	L	
G06	CHICKAHOMINY RIVER / WHITEOAK SWAMP / BEAVERDAM CREEK	L	ML	L	M	N	MM		

Watershed ID	Watershed Name	AGTOT	UTOT	FTOT	TOTN	RIMP	EIMP	**OVERALL**	NHR
G07	CHICKAHOMINY RIVER / RUMLEY MARSH	L	ML	L	L	N	M	M	
G08	LOWER CHICKAHOMINY RIVER/MORRIS CREEK/LOWER DIASCUND CR	L	ML	L	H	L	H	H	
G09	UPPER DIASCUND CREEK / DIASCUND CREEK RESERVOIR	L	L	L	L	L	N	L	M
G10	JAMES RIVER / POWHATAN CREEK / GRAYS CREEK	L	H	L	L	L	MH	H	
G11	JAMES RIVER / PAGEN RIVER / WARWICK RIVER / CHUCKATUCK CR	L	H	L	L	L	L	H	H
G12	SPEIGHTS RUN / LAKE COHOON / LAKE MEADE / LAKE KILBY	L	ML	L	L	L	M	M	
G13	NANSEMOND RIVER / BENNETT CREEK	L	ML	M	L	L	MM		
G14	WESTERN BRANCH RESERVOIR	M	ML	N	N	N	M	M	
G15	HAMPTON ROADS / ELIZABETH RIVER	L	H	L	L	N	H	H	M
H01	JAMES RIVER / REED CREEK	L	L	L	L	MN	M	L	
H02	PEDLAR RIVER	L	L	L	N	L	N	L	H
H03	JAMES RIVER / BLACKWATER CREEK / IVY CREEK	L	H	L	L	H	N	H	L
H04	HARRIS CREEK	L	ML	N	L	N	M	L	
H05	JAMES RIVER / BEAVER CREEK / BECK CREEK	L	ML	L	M	N	ML		
H06	WRECK ISLAND CREEK	L	L	L	N	L	N	L	L
H07	BENT CREEK	L	L	L	N	L	N	L	L
H08	JAMES RIVER / DAVID CREEK	L	L	L	N	L	N	L	L
H09	UPPER TYE RIVER	L	L	H	N	L	N	H	M
H10	PINEY RIVER	L	L	L	L	L	N	L	L
H11	UPPER BUFFALO RIVER	L	L	L	N	L	N	L	L
H12	LOWER BUFFALO RIVER	L	M	M	L	L	N	M	L
H13	LOWER TYE RIVER / RUCKER RUN	L	L	L	L	L	N	L	L
H14	JAMES RIVER / SYCAMORE CREEK	L	L	L	L	L	N	L	M
H15	NORTH FORK ROCKFISH RIVER / SOUTH FORK ROCKFISH RIVER	L	M	L	L	L	N	M	M
H16	LOWER ROCKFISH RIVER	L	L	L	M	M	N	M	L
H17	JAMES RIVER / TOTIER CREEK / ROCK ISLAND CREEK	L	L	L	L	L	N	L	L
H18	NORTH FORK HARDWARE RIVER / SOUTH FORK HARDWARE RIVER	L	L	H	L	L	N	H	L
H19	HARDWARE RIVER	L	L	L	L	L	N	L	L
H20	JAMES RIVER / BEAR GARDEN CREEK / SOUTH CREEK	L	L	L	L	L	N	L	L
H21	UPPER SLATE RIVER	L	L	L	L	L	N	L	L
H22	LOWER SLATE RIVER	L	M	L	L	L	N	M	L
H23	MECHUMS RIVER	L	M	M	L	L	N	M	H
H24	MOORMANS RIVER	L	L	M	L	L	N	M	H
H25	BUCK MOUNTAIN CREEK	L	L	L	L	L	N	L	H
H26	SOUTH FORK RIVANNA RIVER / IVY CREEK	L	M	L	L	M	N	M	H
H27	NORTH FORK RIVANNA RIVER / SWIFT RUN / PREDDY CREEK	L	L	L	L	H	N	H	M
H28	UPPER RIVANNA RIVER / MOORES CREEK	L	H	L	L	M	N	H	L
H29	MIDDLE RIVANNA RIVER / BUCK ISLAND CREEK	L	M	H	L	H	N	H	L
H30	MECHUNK CREEK	L	L	L	L	L	N	L	L
H31	LOWER RIVANNA RIVER / BALLINGER CREEK	L	M	L	L	L	N	M	H
H32	CUNNINGHAM CREEK	L	L	L	L	L	N	L	L
H33	JAMES RIVER / DEEP CREEK / MUDDY CREEK	L	L	L	L	M	N	M	M
H34	BYRD CREEK	L	L	L	L	L	N	L	L
H35	UPPER WILLIS RIVER	L	L	L	L	L	N	L	L

Watershed ID	Watershed Name	AGTOT	UTOT	FTOT	TOTN	RIMP	EIMP	**OVERALL**	NHR
H36	LOWER WILLIS RIVER	L	L	L	L	H	N	H	L
H37	BIG LICKINGHOLE CREEK	L	L	L	L	L	N	L	L
H38	JAMES RIVER / BEAVERDAM CREEK / FINE CREEK	L	M	L	L	L	N	M	H
H39	JAMES RIVER / TUCKAHOE CREEK / NORWOOD CREEK	L	H	L	L	M	L	H	M
I01	UPPER JACKSON RIVER	L	L	H	L	L	N	H	M
I02	BACK CREEK	L	L	L	L	L	N	L	M
I03	LAKE MOOMAW / HUGHES DRAFT	L	L	L	N	N	N	L	M
I04	JACKSON RIVER / FALLING SPRING CREEK	L	L	H	L	L	N	H	M
I05	CEDAR CREEK	L	L	L	L	L	N	L	L
I06	COVE CREEK / SWEET SPRINGS CREEK	L	L	L	N	N	N	L	L
I07	DUNLAP CREEK	L	L	L	N	L	N	L	L
I08	OGLE CREEK	L	L	L	N	L	N	L	L
I09	LOWER JACKSON RIVER / WILSON CREEK / KARNES CREEK	L	ML	L	H	N	H	M	
I10	UPPER POTTS CREEK	L	L	L	N	L	N	L	H
I11	LOWER POTTS CREEK	L	L	L	N	L	N	L	M
I12	UPPER COWPASTURE RIVER	L	L	L	L	L	N	L	M
I13	BULLPASTURE RIVER	L	L	L	L	L	N	L	M
I14	COWPASTURE RIVER / THOMPSON CREEK / DRY RUN	L	L	L	L	L	N	L	M
I15	STUART RUN	L	L	H	L	N	N	H	M
I16	COWPASTURE RIVER / MILL CREEK	L	L	L	N	L	N	L	M
I17	LOWER COWPASTURE RIVER / SIMPSON CREEK / PADS CREEK	L	L	L	N	L	N	L	M
I18	UPPER JAMES RIVER / SINKING CREEK / MILL CREEK	L	L	H	N	MN	H	L	
I19	UPPER CRAIG CREEK	L	L	L	N	L	N	L	M
I20	MEADOW CREEK	H	L	L	N	L	N	H	H
I21	JOHNS CREEK	L	L	L	N	L	N	L	H
I22	LOWER CRAIG CREEK / PATTERSON CREEK / LOWER BARBOURS CREEK	L	L	L	N	L	N		L H
I23	UPPER BARBOURS CREEK	L	L	MN	N	N	M	L	
I24	JAMES RIVER / LAPSLEY RUN	L	L	L	N	MN	M	M	
I25	CATAWBA CREEK	M	L	L	N	L	N	M	H
I26	LOONEY CREEK / MILL CREEK	M	L	L	N	MN	M	L	
I27	JAMES RIVER / JENNINGS CREEK	L	L	L	L	L	N	L	L
I28	JAMES RIVER / ELK CREEK / CEDAR CREEK	L	ML	L	L	N	M	M	
I29	UPPER CALFPASTURE RIVER	L	L	L	L	L	N	L	M
I30	LOWER CALFPASTURE RIVER / MILL CREEK	L	L	L	L	L	N	L	M
I31	BRATTONS RUN	L	L	L	N	L	N	L	L
I32	LITTLE CALFPASTURE RIVER	L	L	L	L	L	N	L	L
I33	UPPER MAURY RIVER / KERRS CREEK	M	L	L	L	MN	M	M	
I34	HAYS CREEK	H	L	ML	H	N	H	L	
I35	MIDDLE MAURY RIVER / MILL CREEK	L	H	L	MM	N	HH		
I36	SOUTH RIVER	L	L	L	L	L	N	L	M
I37	LOWER MAURY RIVER / POAGUE RUN	L	ML	L	L	N	M	M	
I38	BUFFALO CREEK	M	L	L	L	L	N	M	L
J01	UPPER APPOMATTOX RIVER	L	L	L	L	H	N	H	H
J02	BUFFALO CREEK / SPRING CREEK	L	L	L	L	L	N	L	L

Watershed ID	Watershed Name	AGTOT	UTOT	FTOT	TOTN	RIMP	EIMP	**OVERALL**	NHR
J03	SANDY RIVER	L	L	L	L	L	N	L	L
J04	BUSH RIVER	L	L	L	L	L	N	L	L
J05	BRIERY CREEK	L	L	L	L	L	N	L	L
J06	APPOMATTOX RIVER / BIG GUINEA CREEK / SAYLERS CREEK	L	L	L	L	MN	M	L	
J07	APPOMATTOX RIVER / SKINQUARTER CREEK / ROCKY FORD CREEK	L	ML	L	H	N	H	L	
J08	FLAT CREEK	L	L	L	L	L	N	L	M
J09	NIBBS CREEK	L	L	L	L	L	N	L	L
J10	APPOMATTOX RIVER / SMACKS CREEK / SAPPONY CREEK	L	L	L	L	H	N	H	L
J11	DEEP CREEK	L	L	L	L	L	N	L	L
J12	LAKE CHESDIN / WINTERPOCK CREEK / WINTICOMACK CREEK	L	L	L	L	H	N	H	M
J13	NAMOZINE CREEK	L	L	L	L	L	N	L	L
J14	LAKE CHESDIN / WHIPPONOCK CREEK	L	L	L	L	L	N	L	L
J15	LOWER APPOMATTOX RIVER / ASHTON CREEK	L	H	L	L	L	L	H	M
J16	UPPER SWIFT CREEK / SWIFT CREEK RESERVOIR	L	ML	L	L	N	M	L	
J17	LOWER SWIFT CREEK	L	ML	L	L	L	M	M	
K01	SOUTH MEHERRIN RIVER / MIDDLE MEHERRIN RIVER	L	L	L	L	L	N	L	M
K02	NORTH MEHERRIN RIVER	L	L	L	L	L	N	L	M
K03	UPPER MEHERRIN RIVER / FLAT ROCK CREEK / MASON CREEK	L	L	L	L	L	N	L	L
K04	MEHERRIN RIVER / STONY CREEK / TAYLORS CREEK	L	L	L	L	L	N	L	M
K05	MEHERRIN RIVER / GENITO CREEK / ALLEN CREEK	M	ML	L	L	N	M	L	
K06	GREAT CREEK	L	ML	L	L	N	M	M	
K07	ROSES CREEK	L	ML	L	M	N	ML		
K08	MEHERRIN RIVER / REEDY CREEK	L	L	L	L	L	N	L	L
K09	MEHERRIN RIVER / FALLING RUN	L	ML	L	L	N	M	H	
K10	UPPER FONTAINE CREEK / RATTLESNAKE CREEK	L	L	L	L	L	N	L	L
K11	MIDDLEFONTAINE CREEK / CATTAIL CREEK / BEAVERPOND CREEK	L	L	L	L	L	N	L	M
K12	LOWER FONTAINE CREEK / MILL SWAMP	M	L	L	L	L	N	M	L
K13	LOWER MEHERRIN RIVER / TARRARA CREEK / FLAT SWAMP	M	L	L	L	L	N	M	L
K14	UPPER NOTTOWAY RIVER / BIG HOUNDS CREEK	L	L	L	L	L	N	L	H
K15	LITTLE NOTTOWAY RIVER	L	L	L	L	L	N	L	L
K16	NOTTOWAY RIVER / TOMMEHETON CREEK / CROOKED CREEK	L	ML	L	L	N	M	H	
K17	NOTTOWAY RIVER / WAQUA CREEK	L	L	L	L	L	N	L	H
K18	STURGEON CREEK	L	L	L	L	L	N	L	M
K19	NOTTOWAY RIVER / BUCKSKIN CREEK / HARRIS SWAMP	L	L	L	L	L	N	L	H
K20	BUTTERWOOD CREEK / WHITE OAK CREEK	L	L	L	L	L	N	L	L
K21	STONY CREEK / SOUTHWEST SWAMP	L	L	L	L	L	N	L	M
K22	SAPPONY CREEK	L	L	L	L	L	N	L	L
K23	NOTTOWAY RIVER / ROWANTY CREEK / JONES HOLE SWAMP	L	L	L	L	L	N	L	H
K24	NOTTOWAY RIVER / HUNTING QUARTER SWAMP	L	L	L	L	L	N	L	M
K25	RACCOON CREEK / SPRING CREEK	L	L	L	L	L	N	L	L
K26	UPPER THREE CREEK / OTTERDAM SWAMP	L	L	L	L	L	N	L	M
K27	LOWER THREE CREEK / ANGELICO CREEK / POPLAR SWAMP	M	L	L	L	L	N	M	L
K28	NOTTOWAY RIVER / MILL SWAMP / NOTTOWAY SWAMP	M	L	L	L	L	N	M	M
K29	ASSAMOOSICK SWAMP	L	L	L	L	L	N	L	M

Watershed ID	Watershed Name	AGTOT	UTOT	FTOT	TOTN	RIMP	EIMP	**OVERALL**	NHR
K30	LOWER NOTTOWAY RIVER / MILL CREEK	M	L	L	L	L	N	M	M
K31	BLACKWATER SWAMP / WARWICK SWAMP	L	ML	L	L	N	M	M	
K32	UPPER BLACKWATER RIVER / CYPRESS SWAMP	L	L	L	L	L	N	L	M
K33	MIDDLE BLACKWATER RIVER	L	L	L	L	L	N	L	M
K34	RATTLESNAKE SWAMP / MILL SWAMP	L	L	L	L	L	N	L	L
K35	SEACOCK SWAMP	M	L	L	ML	N	M	L	
K36	LOWER BLACKWATER RIVER/KINGSALE SWAMP/CORROWAUGH SWAMP	L	L	L	L	L	N	L	M
K37	UPPER CHOWAN RIVER / BUCKHORN CREEK	L	L	L	ML	N	M	L	
K38	SOMERTON CREEK	L	ML	L	L	N	M	L	
K39	DISMAL SWAMP / CYPRESS SWAMP	L	ML	H	L	N	H	M	
K40	NORTHWEST RIVER	H	ML	L	L	N	H	H	
K41	NORTH LANDING RIVER	H	ML	L	L	N	H	H	
K42	BACK BAY	M	ML	M	N	L	MH		
L01	SOUTH FORK ROANOKE RIVER / BOTTOM CREEK / ELLIOTT CREEK	L	L	L	N	L	N	L	L
L02	NORTH FORK ROANOKE RIVER / BRADSHAW CREEK	L	L	L	N	MN	M	M	
L03	UPPER ROANOKE RIVER	L	H	L	L	L	N	H	L
L04	ROANOKE RIVER / MASON CREEK	L	H	L	L	H	N	H	M
L05	TINKER CREEK / CARVIN CREEK / GLADE CREEK	L	H	L	L	H	N	H	L
L06	BACK CREEK	L	ML	N	L	N	M	L	
L07	ROANOKE RIVER / SMITH MOUNTAIN LAKE / BEAVERDAM CREEK	L	ML	L	M	N	ML		
L08	UPPER BLACKWATER RIVER	L	L	L	L	H	N	H	L
L09	MAGGODEE CREEK	L	L	L	L	H	N	H	L
L10	LOWER BLACKWATER RIVER / SMITH MOUNTAIN LAKE	L	L	L	L	MN	M	L	
L11	GILLS CREEK	L	L	L	L	H	N	H	L
L12	LOWER SMITH MOUNTAIN LAKE	L	H	L	N	N	N	H	L
L13	LEESVILLE LAKE / OLD WOMANS CREEK	L	L	L	N	L	N	L	L
L14	UPPER PIGG RIVER	M	L	L	L	H	N	H	L
L15	BIG CHESTNUT CREEK / LITTLE CHESTNUT CREEK	L	L	L	N	L	N	L	L
L16	MIDDLE PIGG RIVER	L	L	L	N	L	N	L	L
L17	SNOW CREEK / TURKEYCOCK CREEK	L	L	L	N	L	N	L	L
L18	LOWER PIGG RIVER	L	L	L	L	H	N	H	L
L19	ROANOKE RIVER / SYCAMORE CREEK	L	ML	L	L	N	M	L	
L20	UPPER GOOSE CREEK	L	L	L	N	L	N	L	L
L21	MIDDLE GOOSE CREEK / BOREAUGER CREEK / WOLF CREEK	L	L	L	N	L	N	L	L
L22	LOWER GOOSE CREEK	L	L	L	N	L	N	L	L
L23	UPPER BIG OTTER RIVER	L	L	L	N	H	N	H	L
L24	NORTH OTTER CREEK	L	L	L	N	L	N	L	L
L25	BIG OTTER RIVER / ELK CREEK	L	ML	N	H	N	H	L	
L26	LITTLE OTTER RIVER / MACHINE CREEK	L	H	L	L	MN	H	M	
L27	BIG OTTER RIVER / BUFFALO CREEK	L	ML	N	L	N	M	L	
L28	LOWER BIG OTTER RIVER	L	L	L	L	MN	M	L	
L29	FLAT CREEK	L	ML	N	L	N	M	L	
L30	ROANOKE RIVER / STRAIGHTSTONE CREEK / CHILDREY CREEK	L	L	L	L	MN	M	L	
L31	SENECA RIVER	L	L	L	N	N	N	L	L

Watershed ID	Watershed Name	AGTOT	UTOT	FTOT	TOTN	RIMP	EIMP	**OVERALL**	NHR
L32	UPPER FALLING RIVER	L	L	L	N	L	N	L	L
L33	SOUTH FORK FALLING RIVER	L	L	L	N	N	N	L	L
L34	LOWER FALLING RIVER / LITTLE FALLING RIVER	L	L	L	N	H	N	H	L
L35	MOLLEYS CREEK	L	L	L	N	L	N	L	L
L36	ROANOKE RIVER / TURNIP CREEK / CATAWBA CREEK	L	L	L	L	L	N	L	L
L37	CUB CREEK	L	L	L	N	L	N	L	L
L38	ROANOKE RIVER / HUNTING CREEK / WALLACE BRANCH	L	ML	L	L	N	M	L	
L39	ROANOKE CREEK / HORSEPEN CREEK / WARDS FORK CREEK	L	L	L	L	L	N	L	H
L40	ROANOKE RIVER / SANDY CREEK	L	L	L	L	MN	M	H	
L41	DIFFICULT CREEK	L	L	L	L	MN	M	M	
L42	UPPER DAN RIVER / LITTLE DAN RIVER	L	L	L	N	MN	M	M	
L43	UPPER SOUTH MAYO RIVER / RUSSELL CREEK	L	L	L	N	MN	M	L	
L44	SPOON CREEK	L	L	L	N	L	N	L	L
L45	LOWER SOUTH MAYO RIVER	L	L	L	N	L	N	L	L
L46	NORTH MAYO RIVER	L	L	L	N	L	N	L	L
L47	HORSE PASTURE CREEK	L	ML	N	L	N	M	L	
L48	MAYO RIVER	L	ML	N	N	N	M	L	
L49	MATRIMONY CREEK	L	H	L	N	N	N	H	L
L50	UPPER SMITH RIVER	L	L	L	N	L	N	L	L
L51	SMITH RIVER / PHILPOTT RESERVOIR / RENNET BAG CREEK	L	L	L	L	N	N	L	M
L52	SMITH RIVER / TOWN CREEK / BLACKBERRY CREEK	L	L	L	L	L	N	L	L
L53	SMITH RIVER / REED CREEK / BEAVER CREEK	L	H	L	L	L	N	H	L
L54	LOWER SMITH RIVER	L	H	L	L	MN	H	L	
L55	MARROWBONE CREEK	L	L	L	N	L	N	L	L
L56	LEATHERWOOD CREEK	L	ML	N	L	N	M	L	
L57	DAN RIVER / CASCADE CREEK	L	ML	L	L	N	M	L	
L58	SANDY RIVER	H	L	L	N	L	N	H	L
L59	SANDY CREEK(WEST)	L	ML	N	L	N	M	L	
L60	DAN RIVER / CANE CREEK	L	H	L	L	MN	H	L	
L61	FALL CREEK	L	H	L	N	H	N	H	L
L62	DAN RIVER / SANDY CREEK (EAST) / WINNS CREEK	L	L	L	L	MN	M	L	
L63	BIRCH CREEK	L	L	L	L	MN	M	L	
L64	DAN RIVER / LAWSONS CREEK / MIRY CREEK	L	ML	L	M	N	ML		
L65	UPPER BANISTER RIVER	M	L	L	N	L	N	M	L
L66	CHERRYSTONE CREEK	L	L	L	N	H	N	H	L
L67	MIDDLE BANISTER RIVER / ELKHORN CREEK	L	L	L	L	MN	M	L	
L68	WHITEHORN CREEK	L	L	L	N	L	N	L	L
L69	STINKING RIVER	M	L	L	N	L	N	M	L
L70	SANDY CREEK	L	L	L	L	L	N	L	L
L71	LOWER BANISTER RIVER / POLECAT CREEK	L	ML	L	H	N	H	M	
L72	TERRIBLE CREEK	L	L	L	L	L	N	L	L
L73	DAN RIVER / AARONS CREEK	L	L	L	L	MN	M	M	
L74	HYCO RIVER / BIG BLUEWING CREEK / MAYO CREEK	L	L	L	L	L	N	L	M
L75	JOHN KERR RESERVOIR / BUTCHER CREEK	L	ML	L	L	N	M	M	

Watershed ID	Watershed Name	AGTOT	UTOT	FTOT	TOTN	RIMP	EIMP	**OVERALL**	NHR
L76	BUFFALO CREEK	L	ML	L	L	N	M	L	
L77	BLUESTONE CREEK / LITTLE BLUESTONE CREEK	L	L	L	L	L	N	L	M
L78	LAKE GASTON / ALLEN CREEK / COX CREEK	M	L	L	L	L	N	M	M
L79	LAKE GASTON / MILES CREEK / FLAT CREEK / SMITH CREEK	M	L	L	ML	N	M	L	
L80	LAKE GASTON / GREAT CREEK	L	L	L	L	L	N	L	L
L81	LAKE GASTON / POPLAR CREEK	L	L	L	L	L	N	L	L
L82	LAKE GASTON / PEAHILL CREEK	L	L	L	L	L	N	L	L
M01	FISHER RIVER / LITTLE FISHER RIVER	L	L	L	N	N	N	L	L
M02	STEWARTS CREEK / PAULS CREEK / LOVILLS CREEK	L	L	L	N	N	N	L	M
M03	UPPER ARARAT RIVER	M	L	L	N	L	N	M	L
N01	HELTON CREEK / BIG HORSE CREEK	M	L	H	N	L	N	H	M
N02	UPPER NEW RIVER / WILSON CREEK	M	L	L	L	L	N	M	M
N03	FOX CREEK	M	L	L	L	L	N	M	M
N04	NEW RIVER / PEACH BOTTOM CREEK / LITTLE RIVER	M	L	L	L	L	N	M	H
N05	ELK CREEK	H	L	L	L	L	N	H	L
N06	NEW RIVER / CHESTNUT CREEK / BRUSH CREEK	M	ML	L	M	N	MH		
N07	CROOKED CREEK	M	L	ML	L	N	M	H	
N08	NEW RIVER / SHORTS CREEK / PINE RUN	M	L	L	L	MN	M	M	
N09	CRIPPLE CREEK	H	L	L	L	MN	H	M	
N10	UPPER REED CREEK	H	L	MN	L	N	H	L	
N11	LOWER REED CREEK	M	L	L	L	L	N	M	L
N12	COVE CREEK	M	L	MN	L	N	M	L	
N13	UPPER BIG REED ISLAND CREEK / LAUREL FORK	H	L	L	N	L	N	H	H
N14	LOWER BIG REED ISLAND CREEK / GREASY CREEK / BURKS FORK	M	L	ML	L	N	M	H	
N15	LITTLE REED ISLAND CREEK	H	L	L	L	L	N	H	M
N16	NEW RIVER / CLAYTOR LAKE / MACKS CREEK	L	L	L	L	L	N	L	L
N17	PEAK CREEK	L	L	L	L	MN	M	L	
N18	NEW RIVER / CRAB CREEK	L	H	L	MM	N	HM		
N19	EAST FORK LITTLE RIVER	H	L	ML	L	N	H	H	
N20	WEST FORK LITTLE RIVER	M	L	L	N	MN	M	H	
N21	LITTLE RIVER / INDIAN CREEK / BRUSH CREEK	M	L	H	N	MN	H	M	
N22	NEW RIVER / TOMS CREEK / BACK CREEK / STROUBLES CREEK	M	ML	N	M	N	MH		
N23	NEW RIVER / SINKING CREEK	M	L	L	L	L	N	M	M
N24	NEW RIVER / LITTLE STONY CREEK	L	L	MN	L	N	M	M	
N25	WALKER CREEK	M	L	L	L	L	N	M	M
N26	KIMBERLING CREEK	L	L	L	L	L	N	L	M
N27	LITTLE WALKER CREEK	L	L	L	N	L	N	L	L
N28	STONY CREEK	L	L	L	N	L	N	L	L
N29	NEW RIVER / EAST RIVER	L	L	L	L	L	N	L	L
N30	UPPER WOLF CREEK	M	L	L	N	L	N	M	M
N31	HUNTING CAMP CREEK	L	L	L	N	H	N	H	L
N32	LOWER WOLF CREEK / CLEAR FORK	L	L	ML	L	N	M	L	
N33	LAUREL CREEK	L	L	L	N	L	N	L	L
N34	RICH CREEK	L	L	L	N	L	N	L	M

Watershed ID	Watershed Name	AGTOT	UTOT	FTOT	TOTN	RIMP	EIMP	**OVERALL**	NHR
N35	NEW RIVER / ADAIR RUN	L	L	L	N	L	N	L	L
N36	UPPER BLUESTONE RIVER	L	ML	M	MN	M	M		
N37	BLUESTONE RIVER / LAUREL FORK	L	L	L	MM	N	ML		
O01	UPPER SOUTH FORK HOLSTON RIVER	M	L	L	L	L	N	M	L
O02	SOUTH FORK HOLSTON RIVER / WHITETOP LAUREL CREEK	M	L	L	L	L	N	M	H
O03	UPPER MIDDLE FORK HOLSTON RIVER	L	L	L	L	L	N	L	M
O04	MIDDLE FORK HOLSTON RIVER / HUNGRY MOTHER CREEK	M	L	L	L	L	N	M	H
O05	LOWER MIDDLE FORK HOLSTON RIVER	H	L	L	L	MN	H	H	
O06	SOUTH HOLSTON LAKE / WOLF CREEK / FIFTEEN MILE CREEK	H	ML	H	H	N	H	H	
O07	SOUTH FORK HOLSTON RIVER / BEAVER CREEK	M	H	L	MH	N	H	L	
O08	REEDY CREEK	M	ML	N	N	N	M	L	
O09	UPPER NORTH FORK HOLSTON RIVER	M	L	L	N	L	N	M	H
O10	NORTH FORK HOLSTON RIVER / LAUREL CREEK	M	L	L	L	MN	M	H	
O11	NORTH FORK HOLSTON RIVER / WOLF CREEK / TUMBLING CREEK	L	L	ML	M	N	MM		
O12	NORTH FORK HOLSTON RIVER / ABRAMS CREEK	M	L	L	L	L	N	M	H
O13	LOWER NORTH FORK HOLSTON RIVER / POSSUM CREEK	H	L	L	L	H	N	H	H
O14	BIG MOCCASIN CREEK	H	L	L	L	L	N	H	H
P01	UPPER CLINCH RIVER	H	L	MN	M	N	HM		
P02	CLINCH RIVER / INDIAN CREEK	L	L	L	L	L	N	L	H
P03	CLINCH RIVER / MIDDLE CREEK	L	MM	L	MN	M	H		
P04	CLINCH RIVER / SWORDS CREEK / LEWIS CREEK	M	L	L	N	L	N	M	H
P05	LITTLE RIVER	H	L	L	L	L	N	H	H
P06	BIG CEDAR CREEK	H	L	L	ML	N	H	L	
P07	CLINCH RIVER / THOMPSON CREEK	H	L	L	L	L	N	H	H
P08	DUMPS CREEK	L	L	L	N	MN	M	L	
P09	CLINCH RIVER / LITTLE STONY CREEK	M	L	L	N	L	N	M	H
P10	LICK CREEK	L	L	L	L	H	N	H	L
P11	GUEST RIVER	L	ML	L	H	N	H	L	
P12	STONY CREEK	M	L	L	N	L	N	M	M
P13	CLINCH RIVER / STOCK CREEK / COVE CREEK	M	L	L	L	L	N	M	H
P14	COPPER CREEK	H	L	L	L	L	N	H	H
P15	NORTH FORK CLINCH RIVER	M	L	L	L	L	N	M	L
P16	CLINCH RIVER / BLACKWATER CREEK	L	L	L	N	N	N	L	M
P17	UPPER POWELL RIVER / CALLAHAN CREEK / ROARING FORK	L	ML	L	M	N	ML		
P18	SOUTH FORK POWELL RIVER	L	L	L	L	H	N	H	M
P19	POWELL RIVER / CAMP CREEK	L	L	L	L	L	N	L	M
P20	NORTH FORK POWELL RIVER	L	L	L	L	H	N	H	L
P21	POWELL RIVER / HARDY CREEK	L	L	L	L	L	N	L	H
P22	WALLEN CREEK	L	L	L	N	L	N	L	H
P23	POWELL RIVER / MARTIN CREEK	L	L	L	N	L	N	L	H
P24	POWELL RIVER / INDIAN CREEK	L	L	L	N	L	N	L	M
Q01	DRY FORK / JACOBS FORK / HORSEPEN CREEK	L	L	L	N	L	N	L	L
Q02	TUG FORK	L	L	L	N	N	N	L	L
Q03	KNOX CREEK	L	L	L	L	MN	M	L	

Watershed ID	Watershed Name	AGTOT	UTOT	FTOT	TOTN	RIMP	EIMP	**OVERALL**	NHR
Q04	UPPER LEVISA FORK / GARDEN CREEK	L	L	L	L	MN	M	L	
Q05	DISMAL CREEK	L	L	L	L	L	N	L	L
Q06	LEVISA FORK / PRATER CREEK	L	L	L	L	L	N	L	L
Q07	SLATE CREEK	L	L	L	L	MN	M	L	
Q08	LEVISA FORK / HOME CREEK / BULL CREEK	L	L	L	L	H	N	H	L
Q09	UPPER RUSSELL FORK	L	L	L	N	L	N	L	L
Q10	RUSSELL FORK / LICK CREEK / FRYINGPAN CREEK	L	L	L	L	L	N	L	L
Q11	MCCLURE RIVER / CANEY CREEK	L	L	L	L	H	N	H	L
Q12	RUSSELL FORK / RUSSELL PRATER CREEK	L	L	L	L	MN	M	L	
Q13	POUND RIVER	L	L	L	L	MN	M	M	
Q14	CRANESNEST RIVER	L	L	L	L	L	N	L	L
R01	CHESAPEAKE BAY	L	L	L	N	N	L	L	L

AGTOT - Total Agriculture Rank
UTOT - Total Urban Rank
FTOT - Total Forestry Rank
TOTN - Total Nitrogen Rank
RIMP - Riverine Impairments
EIMP - Estuarine Impairments
NHR - Natural Heritage Rank

H = High Rank
M = Medium Rank
L = Low Rank
N = No data; not used in Overall NPS Rank determination